Welcome!

Beyond Warm-ups and Exit Tickets: Effective Ways to Open and Close a Lesson

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Session Goals

- Explore the benefits of planning purposeful opening and closing for lessons to assess and advance students' reasoning and sense making about mathematical relationships.
- Engage in a variety of activities to connect new learning with prior knowledge by promoting reasoning and problem solving.
- Explore the benefits of extending the lesson through a rigorous and relevant opening activity and comprehensive summary activity.

Let’s get started!

- Read the problem given.
- Work a minute or two on your own to solve the problem and write down any ideas you have to work the problem.
- When you have a couple ideas, turn to a partner and share your ideas. Complete the problem with your partner.

Warm-Up

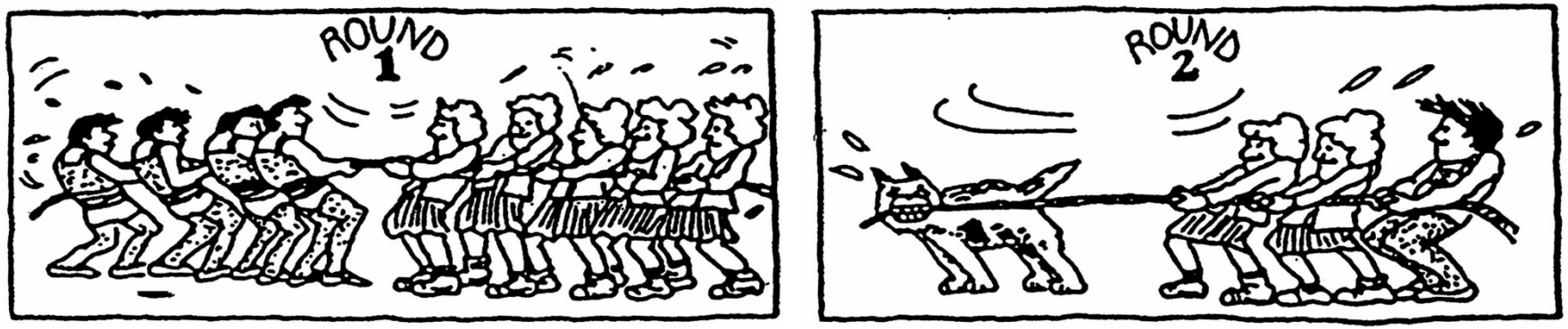
Given:

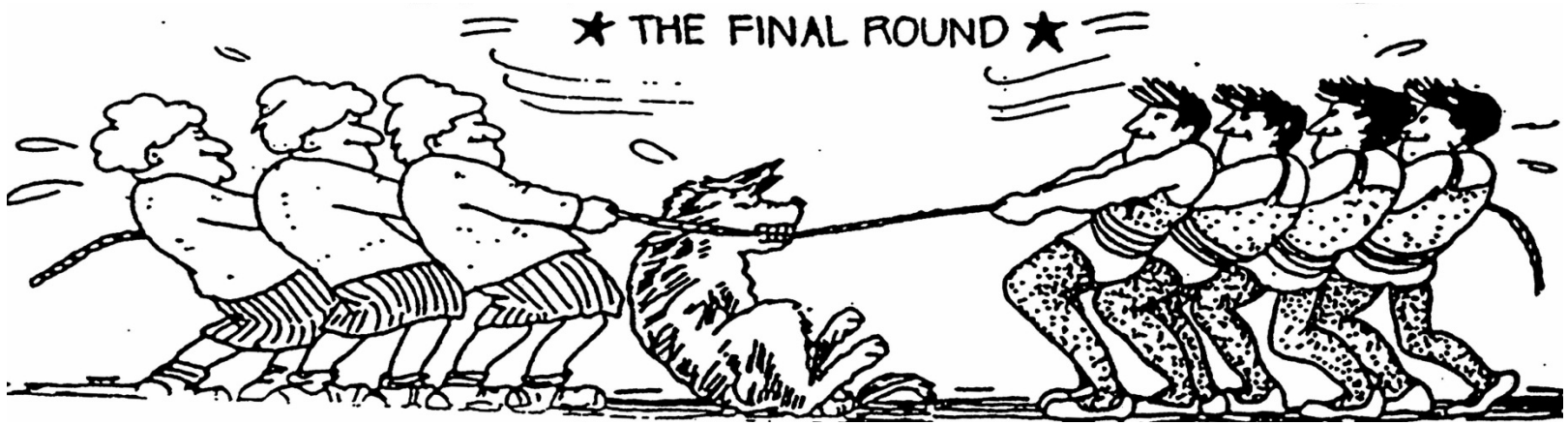
$$4a = 5g \qquad \text{and} \qquad d = a + 2g$$

Use the equations information above to figure out how the following equations compare:

$$3a + d \_\_\_\_\_ 4a$$

Try This -





Brain Teaser

- Solve this riddle.
  - If my graph is shifted up 3 units, the equation of the new line is $y = 3x + 5$.
  - If my graph is shifted down 2 units, the equation of the new line is $y = 3x$.
- What is the original equation?

Processing

What do you notice about these first two problems that make them different from a traditional Warm-Up?

Which One Doesn't Belong?

A

x	y
-2	20
-1	18
0	16
1	14
2	12

B

x	y
-2	3
-1	0
0	-1
1	-10
2	-17

C

x	y
-2	17
-1	10
0	3
1	-4
2	-11

D

x	y
-2	-1
-1	2
0	5
1	8
2	11

Opening Up the Problem

Traditional Problem:
Find the volume of a rectangular prism whose base measures 10 cm by 14 cm and has a height of 5 cm.

A rectangular prism has a base that measures 10 cm by 14 cm. What are some possible values the height could be if the volume must be at least 1250 cm^3 ?

Guess My Measure

- I am an obtuse angle.
- The digits in my angle measurement are odd.
- None of my digits are the same.
- The sum of my digits is thirteen
- The digits are in ascending order.
- My digits are factors of nine.

—Schuler, Lainie & Anderson, Nancy Canavan (2005). *Good Questions for Math Teaching: Why Ask Them and What to Ask Grades 5-8.* Sausalito, CA: Math Solutions, pp.81

The Unexpected -

Consider this cylinder:

Will the length of the circumference be shorter, taller or the same as the height of the can?

Reflecting on Your Experience

Think about the openers you just experienced –

What are some characteristics of a good opening routine?

Classroom Openers

- Sparks students' curiosity
- Gives students the opportunity to talk about mathematics
- Provides entry points for all students
- Sometimes allows for multiple "correct" answers
- Reviews or activates prior knowledge
- Sets up or relates to the lesson of the day

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
6. Attend to precision.

2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.
5. Use appropriate tools strategically.

7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Closing a Lesson

Bringing the Period to a Meaningful End

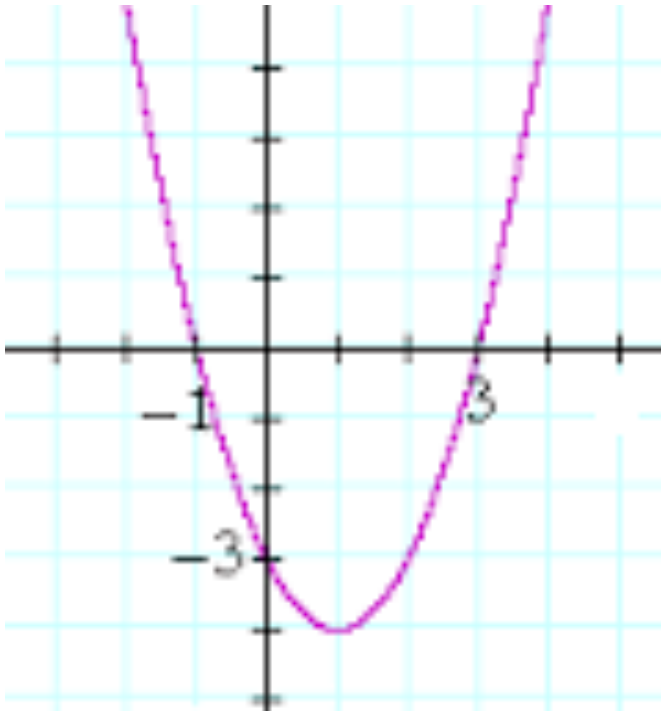
Considering Your Practice

Discuss with a neighbor:

What happens during the last 5-10 minutes of a typical class period in your classroom?

What Do You Know?

Write at least 5 statements you can make about the graph below:



Error Analysis

David and Maria were given these three exponential expressions: 3^2 6^1 2^3

- David thinks that all three expression simplify to a value of 6.
- Maria thinks David is wrong, and each expression has a different answer.

Who is correct and why?

Reflection

What do you notice about these first two examples? What do they have in common?

Defending Choice

We have studied three ways to solve a system of equations:
Graphing, Substitution, and Elimination.

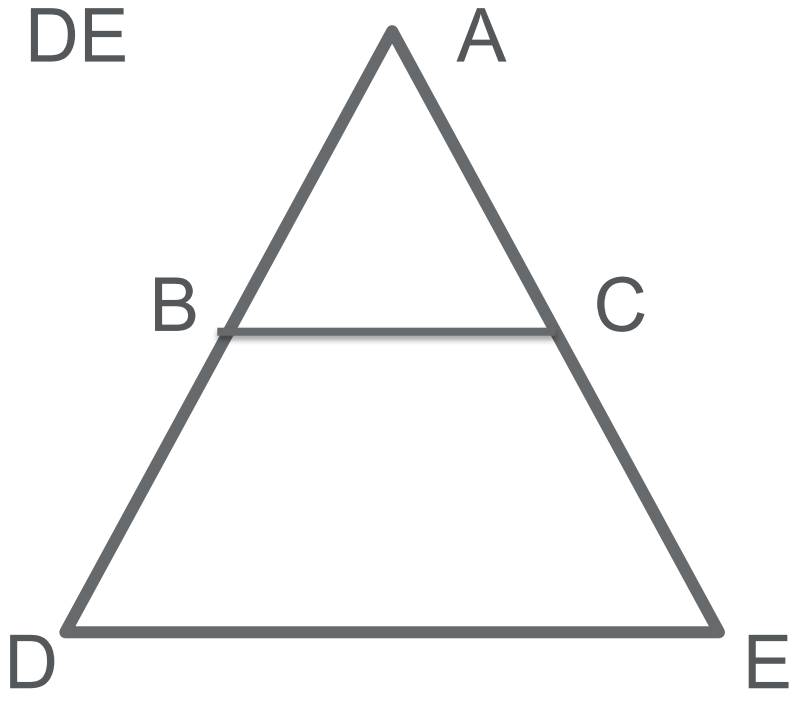
Study the system below. Which method would be the most efficient way to solve this? Describe why your choice would be the most efficient method to use.

$$3x + y = 9$$
$$x = y - 1$$

Tell Me All You Can

Tell me all you can about the diagram below.

$\overline{BC} \parallel \overline{DE}$



How Do We Know?

- How do we know when we can use the Pythagorean theorem?

- How do we know which side of a right triangle is the ***adjacent*** side and which side is the ***opposite***, when using triangle ratios?

Reflection

Discuss with a partner:

How might a meaningful closing activity impact student learning?

How does closure impact student learning?

A meaningful closing activity can help:

- Review key ideas of the lesson
- Check for understanding and inform upcoming instruction.
- Make connections to prior learning
- Correct misunderstandings
- Show what students know and what they are still struggling with.

Thank you!

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